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I CLAIM:

1. A method of calibrating a spectroscopic device for providing a non-invasive measurement of an analyte level in a sample, comprising:
- 5 (a) providing a plurality of calibration algorithms;
- (b) taking a set of non-invasive measurements on said sample with said spectroscopic device;
- (c) calculating a predicted set of analyte levels for each of the calibration algorithms in response to the set of non-invasive
- 10 measurements, each of the predicted sets of analyte levels being characterized by a variability range, a slope, an  $R^2$  (a square of the correlation between said set of non-invasive measurements and said predicted set of analyte levels), and a standard error of prediction; and
- (d) selecting an appropriate calibration algorithm by using a
- 15 suitability score based on the variability range, the slope, the  $R^2$  and the standard error of prediction for each of the predicted sets of analyte levels.
2. A method according to claim 1 wherein, step (d) comprises
- 20 (i) selecting the predicted sets of analyte levels in which the standard error of prediction is less than an upper error limit, the variability range is greater than a lower range limit, and the slope is between a first lower slope limit and an upper slope limit said lower and upper slope limits defining an acceptable slope range;
- 25 (ii) for each of the predicted sets selected in step (i), calculating a suitability score in response to the slope, the  $R^2$  and the standard error of prediction for that predicted set, and selecting the calibration algorithm corresponding to the predicted set having the optimal (highest) suitability score as the appropriate calibration algorithm;
- 30 (iii) if no predicted sets are selected in step (i), selecting the predicted sets of analyte levels in which the variability range is lower than the lower range limit and in which the standard error of prediction is less than the upper error limit,
- (iv) from each of the predicted sets selected in step (iii), selecting
- 35 the calibration algorithm corresponding to the predicted set having the

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lowest standard error of prediction as the appropriate calibration algorithm; and

(v) if no predicted sets are selected in step (i), or step (iii), determining that no calibration algorithm is appropriate.

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3. A method according to claim 2 wherein, said acceptable slope range is subdivided into a plurality of subranges corresponding to a plurality of levels, comprising a first level and one or more subsequent levels, and if no predicted sets are selected in the first level, then

10 repeating step (i) at each subsequent level until a predicted set is selected or there are no more subsequent levels.

4. A method according to claim 2 wherein, said lower slope limit is less than one and said upper slope limit is greater than one.

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5. A method according to claim 4 wherein, said lower slope limit is about 0.3 and said upper slope limit is about 1.05.

6. A method according to claim 3, wherein, said acceptable slope range is defined by a lower slope limit of about 0.3 an upper slope limit of about 1.05.

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7. A method according to claim 1 wherein, the plurality of calibration algorithms provided in step (a) are first generated by the steps of:

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(i) compiling non-invasive and corresponding reference data sets of measurements of analyte levels for each of a number of samples;

(ii) rejecting data sets that are not suitable for calibration;

(iii) combining data sets that are suitable for calibration into a plurality of groups depending on whether correlations of the combined data sets meet predetermined criteria; and

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(iv) generating a calibration algorithm for each of the groups of data sets.

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8. A method according to claim 7 wherein the predetermined criteria in step (iii) include minimizing correlations of the combined data

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sets in a particular group with parameters other than said analyte and maximizing the correlation between data sets in a particular group.

5 9. A method according to claim 7 wherein steps (iii) and (iv) are performed using partial least-squares regression analysis.

10. A method according to claim 7 wherein steps (a), (c), and (d) are performed on a computer associated with the spectroscopic device.

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11. A method according to any one of claims 1-10 wherein the sample is an individual patient, the spectroscopic device is a near-infrared spectrophotometer, and the analyte is selected from the group consisting of glucose, hemoglobin, albumin, cholesterol, and ethanol.